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ABSTRACT

In 1969, the American Educational Research Association (AERA) empaneled a Task Force on Research Training and charged it with (1) building a relevant knowledge base about training needs and problems and (2) developing procedures to attack these problems. During its two years of study, the Task Force carried out a series of three USOE-supported activities designed to identify specific skills and knowledge required in educational research and evaluation. The first activity included two steps. First, the Task Force drafted lists of skills they thought were necessary in conducting research and evaluation in education. Second, the lists of skills were "reality tested" through interviews with 60 employers and supervisors of research and evaluation personnel. The second activity was not strictly empirical in nature, although it used as input the results yielded by the interviews described above and depended on informal observation for the rest. In the third activity, a task analysis of research and evaluation activities in 13 agencies was conducted. These agencies included universities, research and development centers, private research agencies, regional educational laboratories, and public schools rated by the Task Force members as doing high quality work. The purpose of this paper is to synthesize the results of these three previous Task Force efforts into a single list of competencies frequently needed in educational research and evaluation. (MV)

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SOME TASKS AND COMPETENCIES FREQUENTLY REQUIRED IN EDUCATIONAL RESEARCH AND EVALUATION

No. 5

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Northwest Regional Educational Laboratory

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I. SOME TASKS AND COMPETENCIES FREQUENTLY REQUIRED IN EDUCATIONAL RESEARCH AND EVALUATION

Many educational evaluators and researchers are handicapped by lack of adequate skill and knowledge about substantive and methodological requisites in their areas of investigation. Even the researchers and evaluators who are initially well trained for their respective roles are soon faced with the possibility of obsolescence because of the scarcity of relevant inservice training programs in their area of specialization. Without adequate opportunities for continued education, such persons often find it difficult to keep abreast of new substantive and methodological developments in their fields.

This problem was recognized early by the American Educational Research Association (AERA) which has worked for almost a decade to offer inservice training opportunities to its members and other professionals engaged in research and research-related activities in education.[1] As part of this training effort, AERA empaneled a Task Force on Research Training[2] and charged it

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[1]Popham (1974) provided an excellent summary of AERA's efforts in training during the past decade.

[2]The Task Force, chaired in 1969 by Robert M. Gagné and in 1970-71 by the author, included the following members: Abbott L. Ferriss, Myles I. Friedman, William J. Gephart, John E. Hopkins, Reginald L. Jones, Jason Millman, Harold E. Mitzel, Ellis B. Page, W. James Popham, Ernst Z. Rothkopf, and Sam D. Sieber.

with (1) building a relevant knowledge base about training needs and problems and (2) developing procedures to attack these problems. The Task Force quickly became aware that one of the most serious impediments to planning and conducting training programs for research and evaluation personnel in education is lack of knowledge about which particular competencies are most important in these inquiry activities. Knowledge about such competencies was needed before AERA could determine whether its training programs were effective in correcting the deficiencies noted above.

During its two years of study, the Task Force carried out a series of three USOE-supported activities designed to identify specific skills and knowledge required in educational research and evaluation.[3] The first activity (Worthen & Gagné, 1969) included two steps. First, the Task Force drafted lists of skills they thought were necessary in conducting research and evaluation in education. Second, the lists of skills were "reality tested" through interviews with 60 employers and supervisors of research and evaluation personnel to determine which skills they viewed as important in conducting research and evaluation in the interviewee's agency, which they saw as unimportant, and whether skills they perceived as important had been omitted from the list.

The second activity was not strictly empirical in nature, although it used as input the results yielded by the interviews described above and depended on informal observation for the rest. The earlier lists were reviewed and found to exclude some competencies the reviewers (Glass & Worthen, 1970) noted

[3]Although not reported here, the Task Force also made an effort to identify competencies in educational development and diffusion, which are reported in Worthen & Gagné (1969) and Anderson, et al. (1971).

to be frequently required in their own educational inquiry as well as in studies conducted by colleagues with whose work they were well acquainted. The addition of these supplemental competencies resulted in a revised list of skills and knowledge viewed by its authors as important for educational researchers and evaluators.

In the third activity (Anderson, et al., 1971), a task analysis of research and evaluation activities in 13 agencies was conducted. These agencies included universities, research and development centers, private research agencies, regional educational laboratories, and public schools rated by the Task Force members as doing high quality work.[4] One hundred and nine research and evaluation workers in those agencies were studied to determine what tasks they were called upon to perform in their work and what competencies (skills and knowledge) were required to perform them. Factor analyses of the results yielded several clusters of common research and evaluation tasks and competencies.

Methods used in each of the Task Force activities are described in detail in the 1971 study referenced above and will not be repeated here.

A Synthesis of the Task Force Analyses

The purpose of this paper is to synthesize the results of the three previous Task Force efforts into a single list of competencies frequently

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[4]These ratings depended on raters experienced with the agencies through professional activities such as consultation with agency personnel, review of products, and the like.

needed in educational research and evaluation.[5] Each of the three earlier activities depended on a different approach to identifying such competencies and each approach carried with it different assets and deficits. To reduce unique error contributed by any one source, the tasks and competencies entered in the synthesis are those which are identifiable in at least two of the earlier analyses (and in a majority of instances all three). Given this effort to draw out the most common threads, this synthesis seems likely to provide a more accurate depiction of competencies commonly used in the field than is true of any of the previous individual efforts on which it depends.

The synthesis has resulted in a list of 25 general tasks which researchers and/or evaluators frequently must perform. For most of these tasks, competencies necessary to perform the task were also identified. "Competencies" is used in this paper to refer both to specific skills and knowledge.

Four caveats are necessary. First, there is no claim that the 25 general tasks and attendant competencies include all the important tasks or competencies necessary in the broad range of methodology which might be employed in educational research or evaluation. For example, few skills of the ethnographer turn up in these lists. Such exclusions should not be construed as suggesting that such skills are unimportant, only that they were not found to be frequently required in the work of the broad sample of researchers and evaluators in the

[5]It might be noted that not all investigation of research and evaluation competencies has been conducted under the aegis of AERA sponsorship. Owens (1968), Coller (1970), and Schalock & Sell (1972) completed similar analyses. In general, the results of those studies do not differ significantly from those conducted by the Task Force, and no attempt has been made to include results of these studies in the present synthesis.

analyses from which the synthesis is drawn. Further, there are obviously personal characteristics (e.g., attitudes, value structures, personality traits) which are important to the successful conduct of research and evaluation work but which were not included in any of the sources on which the present synthesis depends.

Second, there are no competencies listed for some tasks, whereas other tasks subsume long lists of relevant competencies. This unevenness results from the fact that practicing researchers and evaluators studied in the 1969 and 1971 analyses and the authors who completed the 1970 analysis all seemed better able to articulate the competencies required to perform some tasks than they were for others. It may be that researchers and evaluators perform these latter tasks intuitively and have not analyzed them sufficiently to be clear about their specific elements. In the case of such "under-understood" tasks, it should not be surprising that few relevant skills and knowledge come easily to the mind. Rather than hazarding guesses to fill these gaps, it seems advisable to await further research efforts on essential competencies in the hope that these areas will be further illuminated.

Third, no effort has been made to specifically label each task and competency as belonging more to research than to evaluation or vice versa. It has been argued elsewhere (Glass & Worthen, 1970b) that research and evaluation differ in important ways (e.g., in the purpose for which they are conducted), but methodologically they are often similar, depending to a considerable degree on the same type of knowledge and skill. Most of the tasks and competencies in the following lists are relevant to both research and

evaluation. In cases where tasks are relevant to one but not the other, this distinction is made plain in the discussion sections.

Fourth, there is no implication that all tasks are involved in every inquiry or that all of the tasks must necessarily be carried out by any one individual. As in most human endeavors, teamwork is a boon to much research and evaluation. Only the lone wolf researcher or evaluator who chooses (or is forced) to work without benefit of colleagueship or expert consultation would ever need to possess a high degree of competence in all of the relevant areas listed below, and then only if it were necessary to conduct all the types of studies which would bring these particular tasks and competencies into play. However, it is also true that the more important competencies an individual possesses, the less assistance must be sought from others--a happy state indeed. An individual proficient in more of the important competencies is more flexible in working in a variety of research and evaluation settings than an individual proficient in a smaller subset of the important competencies and therefore limited to performing in settings where that narrow expertise is relevant. However, with the increasing sophistication and specialization in the various fields on which educational evaluation and research depend, it seems increasingly unlikely that any single individual will be such a paragon as to be highly skilled in all of the important areas. The more reasonable stance seems to be to assert only that the full range of relevant competencies be either possessed by or readily available to whatever entity is carrying out the work--whether that entity be an individual, a team, or an organization.

II. TWENTY-FIVE GENERAL RESEARCH AND EVALUATION TASKS AND RELATED COMPETENCIES[6]

Each of the 25 tasks on this and subsequent pages is followed by (a) a brief elaboration of why that task is important to the researcher and/or evaluator and (b) a listing of any competencies which seem on the basis of the previous analyses to be necessary to performance of the task.

1. Obtaining information about an area to be researched or a phenomenon to be evaluated.

   Knowledge of an area of study is a necessary precursor to research activities, just as evaluation judgments are necessarily preceded by an understanding of precisely what phenomenon is being judged. Obtaining information from antecedents in science and practice depends on a variety of specific competencies.

   1.1 Knowledge of how formal search procedures can be used to obtain information.

   1.2 Ability to use library research techniques.

   1.3 Ability to use ERIC and other information retrieval systems.

   1.4 Knowledge of how to obtain information through informal means, such as identifying and contacting others working in the same area.

[6]Portions of the narrative in this section draw on an earlier paper by Glass & Worthen (1970).

2. Drawing implications from results of prior research and practice.

No research endeavor stands alone, and no researcher can afford to ignore or slight the activity of carefully studying the literature of his or her field and drawing the appropriate inferences for the future course of research in that discipline. Whether a historian, a philosopher, a psychologist, a sociologist, or a statistician, the researcher must be able to interpret, evaluate and synthesize the relevant literature. The evaluator also draws on prior research, especially as a basis for determining standards against which a judgment will be made. Study of various ways in which a particular education treatment has been applied in the past is important to insure that it is not unwittingly evaluated in its weakest case or against irrelevant or unreasonable standards.

2.1 Ability to review and evaluate research and research-related reports.

2.2 Ability to review and evaluate relevant educational practices.

2.3 Ability to draw correct inferences, conclusions, or generalizations.

2.4 Ability to synthesize or summarize extant knowledge.

3. Conceptualizing the research problem or defining the object of the evaluation.

This task is probably both the most important and the most neglected aspect of most research and evaluation studies. The researcher must be able to identify significant problems posed by the tradition of inquiry and the accumulated works of both predecessors and contemporaries. The evaluator's problem is generally set by the client, but it must nonetheless be defined as sharply as that of the researcher.

3.1 Ability to identify and articulate the problem in a research study.

3.2 Ability to define precisely the phenomenon to be judged in an evaluation study.

4. Selecting an appropriate inquiry strategy for addressing the research or evaluation problem.

Far too often research or evaluation is based on a particular inquiry approach with which the researcher or evaluator is most familiar, even when that approach is obviously inefficient or inappropriate for the particular research or evaluation problem. Methodological breadth is important to research and critical to evaluation, where the client sets the problems, thereby eliminating the luxury the researcher sometimes enjoys of defining problems in an area where he or she is the most comfortable. In evaluation, it is important to make thoughtful and informed choices among the general approaches afforded by the various disciplines.

4.1 Knowledge of the variety of common inquiry strategies in education (e.g., depiction studies, correlational studies, experimental studies).

4.2 Knowledge of inquiry strategies in other disciplines (e.g., philosophical analysis, historiography).

5. Formulating hypotheses or questions to be answered by the study.[7]

This activity is the hallmark of rigorous inquiry, whether empirical or not. Hence, formulating hypotheses or research questions is important for all types of educational research. In evaluation, the evaluative questions to be answered are often more penetrating than mere assessment of the attainment of stated objectives.

5.1 Ability to formulate testable hypotheses or answerable questions in a research or evaluation study.

5.2 Eliciting evaluative questions from all important audiences for an evaluation.

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[7]This and several subsequent tasks are relevant only if an empirical, behavioral strategy (the most common study identified in the earlier analyses) is selected.

6. Specifying data or evidence necessary for a rigorous test of the hypothesis or an unequivocal answer to the research or evaluation question.

This activity, which is important in the pursuit of any empirical research or evaluation effort, refers to general types of data (e.g., information on cost-effectiveness of the program) rather than specific classes of variables (e.g., cost per pupil, student gains on achievement measures) which are discussed elsewhere. The necessary competencies are implicit in the statement of the task.

7. Selecting appropriate research and evaluation designs to collect data to test the hypothesis or answer the question.

Observational techniques and mail surveys can be used to collect the same data, but the method used has obvious implications for the types of questions which can be answered. This activity requires not only knowledge of alternative designs but also a sense of their feasibility in a particular study.

7.1 Knowledge of types of designs (e.g., experimental, quasi-experimental, naturalistic).

7.2 Knowledge of the questions which can and cannot be answered by each design.

7.3 Knowledge of feasibility constraints (e.g., time, access to subjects, control, money) which are associated with each design.

8. Identifying the population to which results should be generalized, and selecting a sample of the population.

Identifying relevant populations and sampling them representatively is crucial to many forms of empirical research. Sociological survey research is almost totally dependent for its utility upon this step having been successfully completed. However, in historical inquiry, historians seldom have control over those events which provide evidence for their

conclusions. Educational historians of the past, and to a lesser extent contemporary historians, are dependent upon those traces of the past events which were fortuitously left beh d (in diaries, private correspondence, etc.) by a handful of extraordinary and nonrepresentative individuals. Although historians are greatly concerned with the evidence which survives the rigors of time and comes into their hands, they are seldom forced to evaluate the generality of such evidence in the same manner as the sociologist.

In evaluation, selection of a sample in such a way that the results can be generalized to a population is often of utmost importance. Although it is true that evaluations of particular programs often include the entire population of interest, sampling is needed when it is not feasible or efficient to collect data on the entire population. For example, it would scarcely be necessary to survey every parent in a large school district to evaluate parent reaction to the district's new busing policies. Random sampling of parents and generalizing back to the population would be as appropriate here as in the most rigorous research study.

8.1 Ability to identify the population of concern.

8.2 Ability to differentiate between theoretical populations and accessible populations.

8.3 Knowledge of sampling theory and techniques, including variations on simple random sampling such as stratified sampling, cluster sampling, and multi-stage sampling.

9. Applying the research or evaluation design and recognizing or controlling threats to validity.

Much empirical research involves experimental designs and most of the competencies listed below pertain directly to that type of design. This is

probably a function of the ease with which these competencies were identified by the practicing researchers and evaluators who contributed to this synthesis. This should not be construed as endorsement of the imbalance in competencies which appears below but only a commentary on general naivete about the details to be considered in setting up other types of designs. This status is particularly troublesome because of the frequent cases where experimentation is inappropriate. For example, in no real sense is an experimental design applied in nonbehavioral research into the history or the philosophy of education. Other designs are applied and each has a touchstone of acceptability for determining whether the results are reasonably isomorphic with reality. In evaluation, the design in some instances will be less sophisticated, but the concern for threats to the validity of the results is just as great.

9.1 Ability to recognize and eliminate or account for threats to validity inherent in any design under use.

(For Experimental or Quasi-Experimental Studies, competencies 9.2 through 9.10 are relevant)

9.2 Knowledge of specific experimental and quasi-experimental research designs.

9.3 Knowledge of factors which jeopardize internal and external validity.

9.4 Ability to design studies to control extraneous variables.

9.5 Knowledge of randomization as a means of experimental control and its relationship to inferential statistics.

9.6 Knowledge of fixed-effects, random-effects and mixed-effects designs; crossed and nested factors; the nature of interactions and their graphing and interpretation.

9.7 Knowledge of the nature and problems in the use and analysis of "repeated measures" designs.

9.8 Knowledge of covarying, blocking and stratifying as means of increasing precision of estimation in experimental designs.

9.9 Knowledge of the effect of measurement error on the precision (power) of an experiment.

9.10 Knowledge of purposes underlying the use of randomized blocks, Latin square, fractional factorial, incomplete block designs, etc.

10. Identifying at appropriate levels of generality the goals of the program to be evaluated.[8]

It cannot be assumed that the goals of a program which one wishes to evaluate are known or stated in advance of the evaluation. An important activity in getting many evaluations under way is eliciting from the responsible persons the goals and objectives toward which the program is directed. The identification of these goals is more than a routine activity of soliciting verbal statement of goals from program personnel. Done properly, the identification of goals can entail some of the most sophisticated technology of survey research and interviewing. What many evaluators experience as frustration in their attempts to elicit statements of goals from program personnel is actually evidence of their own lack of expertise in such activities.

10.1 Ability to identify all audiences which should help determine program goals.

10.2 Ability to help others identify their goals.

10.3 Ability to help others prioritize their goals.

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[8]Scriven's (1972) notions about goal-free evaluation were little more than a gleam in his rhetoric when the analyses synthesized herein were conducted. If the concept has caught on among evaluators, an analysis conducted today conceivably could reveal that an important task is to not identify the goals of the program being evaluated.

11. Assessing the value and feasibility of program goals.

This activity is the earliest explicitly evaluative act of an evaluation. In an evaluation, the goals of the program should not be accepted at face value, but should be regarded as elements of the program appropriate for direct evaluation, much as one evaluates program operations and outcomes. In some instances, the justification of goals comes from empirical research in education or the social sciences. Often the justification lies in a needs assessment which has been conducted specifically for the program. In other instances, one must turn to nonempirical, nonbehavioral disciplines such as philosophy and law in seeking to evaluate program goals. Assessing the value of program goals is an activity likely to carry the evaluator far beyond typical concerns with behavioral statements of objectives, criterion-referenced tests, and statistical analysis. It requires the evaluator to be educated broadly in the social sciences and philosophy and to be responsive to questions of value which are broader than those which can be investigated within the span of one evaluative study.

11.1 Ability to determine appropriate standards for judging value of program goals.

11.2 Ability to apply standards to program goals to determine the worth of those goals.

11.3 Ability to determine the feasibility of program goals in relation to resources available to try to attain those goals.

11.4 Ability to determine actual and intended system outcomes to identify discrepancies (needs) which exist in the system.

12. Identifying standards or norms for judging worth of the phenomenon to be evaluated.

The measurements and observations taken in an evaluation cannot be translated into judgments of worth without standards or norms. The formality of these standards and norms may vary greatly, but nonetheless a standard is implied whenever a judgment of worth is derived from an observation. The evaluator must be sensitive to the various standards which different groups use in judging worth and, from among these standards, must either choose those which can best be justified or must use some technique to combine and possibly weight the various standards. Standards may be either internal or external, such as the APA Code of Ethics (external) or the percentile rank of a student in class (internal).

13. Translating broad objectives into specific measurable objectives.

General goal statements often must be operationalized into specific statements of objectives. The onus of making this translation clearly lies with the evaluator who possesses the technical skill for doing so and not on program personnel to whom the language of operationalization and behaviorism is foreign and unfamiliar. Of course, the translated objectives must be reviewed by program personnel to prevent unconscious biases of the evaluator from producing operational objectives different in intent from the broad objectives with which the program began.

13.1 Ability to state objectives in measurable terms.

13.2 Ability to elicit and incorporate reactions of program personnel to statements of specific objectives.

14. Identifying classes of variables for measurement.

The identification of behaviors for measurement is crucial in psychological and sociological research on education and in educational evaluations which borrow these methods. It is far less crucial for historical and philosophical research. This activity is largely dependent on knowledge of the phenomena being reserched or evaluated. The evaluator who is not a content specialist in the area under consideration can elicit this knowledge by combining the same techniques used in eliciting program objectives with consideration of the kinds of inferences called for in the design and the standards to be used in judging the adequacy of the data and inferences.

15. Selecting or developing techniques of measurement.

This task is a cornerstone of much empirical research. Coupled with the next task it constitutes the most critical stage in the pursuit of empirical behavioral inquiry. The evaluator also must have skill in selecting those techniques that will produce objective data on outcomes (where objective data are possible). An evaluator must know when a measurement technique threatens to misrepresent a set of behaviors and what to do to correct the problem.

15.1 Knowledge of properties of nominal, ordinal, interval, and measurement scales.

15.2 Knowledge of fundamental theorems on the differential weighting of test items.

15.3 Knowledge of general principles of instrument construction.

15.4 Knowledge of major forms of assessment of knowledge and cognitive skills including multiple-choice, completion, free-responses, ranking, matching formats, etc.

15.5 Knowledge of primary methods of assessing attitudes and other affective variables, including Likert and Thurstone scales, semantic differential, Q-sort, sociometry, etc.

15.6 Knowledge of how to construct and use rating scales (including methods of assessing rater agreement), checklists, questionnaires, interview schedules, and observation systems.

15.7 Ability to write unambiguous items in vocabulary appropriate to the specified audience.

15.8 Ability to select appropriate standardized tests or instruments.

15.9 Knowledge of uses of criterion-referenced and objectives-referenced testing.

16. Assessing the validity of measurement techniques.

Scarcely any skill could be more important to empirical inquiry than this one. In research, the validity of the findings depends in large part on skill in embodying the general constructs of inquiry in a set of measurement techniques. As for evaluation, the worth of an educational program lies in its outcomes.[9] It is crucial that the proper outcomes be validly measured. Objective, valid data on program performance are the sine qua non of any justifiable evaluation.

16.1 Fundamental postulates and theorems of classical true-score theory.

16.2 Knowledge of or ability to determine instrument reliability, including types of reliability coefficients.

16.3 Knowledge of or ability to determine instrument validity, including various approaches to determining validity.

16.4 Knowledge of norming procedures.

16.5 Ability to conduct item analyses, including computing difficulty and discrimination indices.

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[9]Some would argue that the worth of a program lies in its processes or its ideology. To each his own.

17. Using appropriate methods to collect data (tests, interviews, unobtrusive measures, etc.)

Researchers must learn well a small number of data-gathering methods appropriate to the problems in their discipline. Only rarely will a researcher's inquiry range so broadly as to require skill in a majority of the techniques for collecting data listed under earlier tasks. Not so the evaluator, who often is required to work across several disciplines and therefore needs familiarity with a much wider variety of data collection methods.

17.1 Ability to administer all data collection instruments necessary to one's research or evaluation study.

17.2 Ability to conduct all necessary "non-instrument" data collection techniques, such as interviews and content analysis.

18. Monitoring the program to detect deviations from design or specified procedures.

It is, of course, important to know what one researches or evaluates. It is insufficient to accept mere labels when one has invested large portions of time and money in the observation and judgment of outcomes. It is necessary that a program be monitored through site visitations, interview techniques, survey research methods, etc., so that the evaluator is clearly aware of the degree to which the proposed program was made operational or the researcher is certain the treatment has been maintained. It is misleading to pronounce a judgment of "unworthy" on a team teaching program or conclude that team teaching is inferior to other methods if team teaching was never genuinely attempted.

19. Choosing and employing appropriate techniques of statistical analysis. This task subsumes an enormous number of activities. It involves understanding the general role, types, and assumptions of statistical techniques and drawing on such knowledge in using appropriate techniques for analyzing data. Obviously this task is relatively unimportant for researchers in "rational" disciplines, such as philosophers and historians. It becomes important for empirical behavioral researchers such as sociologists and psychologists. It is a critical skill for methodological researchers who are frequently called upon to advise empirical researchers of many persuasions on the proper analysis of research data.

The evaluator must be broadly knowledgeable in the area of statistical data analysis. A clear understanding of the purposes and general use of a variety of data analytic techniques is crucial in most evaluation studies. It is important to know when a factor analysis bears critically on an evaluative question and when it is mere window dressing for a flashy but superficial evaluation.

19.1 Knowledge of the general roles of statistical techniques (e.g., descriptive vs. inferential use of statistics).

19.2 Knowledge of differences in major classes of statistical techniques (e.g., Bayesian vs. Fisherian inference; parametric vs. nonparametric statistics) and principal concepts associated with each class.

19.3 Knowledge of models and theories underlying statistical techniques (e.g., general linear model, permutation theory, properties of principal probability distributions).

19.4 Knowledge of major concepts and use of principal statistical techniques (e.g., partial correlation, analysis of covariance).

19.5 Knowledge of assumptions underlying principal statistical techniques and consequences of failure to meet these assumptions.

19.6 Ability to choose (or design) appropriate statistical techniques for analysis of a particular set of data.

19.7 Ability to use specific statistical techniques correctly.

20. Using electronic computers and computer-related equipment.

The entire field of statistical analysis is currently undergoing a slow but pervasive change due to the introduction of high-speed electronic computation. The researcher or evaluator who is unable to use the computer to advantage not only suffers under the burden of inefficiency but will soon add to it the pathos of obsolescence.

20.1 Ability to use computer-related equipment such as sorters, reproducers, or automatic test scoring machines.

20.2 Ability to design card layouts to allow data analysis within computer constraints, and ability to use standardized computer programs (e.g., BMD series).

20.3 Ability to write computer programs.

20.4 Ability to use computer coding.

20.5 Knowledge of capabilities of local computer systems.

20.6 Ability to read and interpret computer output.

21. Interpreting and drawing appropriate conclusions from data analysis.

This task is the heart of both evaluation and empirical research. Its importance should be apparent and needs no further comment here except to note that how well one can interpret data is also dependent on how well other steps in the study have been conducted.

22. Reporting research and evaluation findings and implications.

This task is of primary importance for both the educational researcher and evaluator, although it is conducted slightly differently by each.

Science is necessarily public and hence the act of publication is important in its growth. By reporting research findings, the researcher brings the inquiry process full cycle. One scholar's contribution thus enters the literature to be drawn on by colleagues in the pursuit of new knowledge. In a research report, detail and completeness are valued highly and the researcher is communicating with colleagues who already have considerable experience and background in the area being discussed. The writing of the evaluation report is a different matter altogether. The evaluator is typically reporting to an audience which does not share the same perspective, grasp of technical topics, nor interest in technical details. The responsibility to communicate findings rests more heavily with the evaluator than with the researcher. The evaluator will have to adopt non-technical language and must refrain from over-reliance on tabular presentation of data analyses. Discursive commentary on test validity and reliability and other topics which the evaluator's audience will not find central to their concerns must be avoided. At this final stage of the endeavor, the evaluator will play a role much more akin to the journalist than the scientist.

22.1 Knowledge of the technical background and experience of the audience(s) for the report.

22.2 Ability to write in a style and at a level appropriate to a specified audience.

22.3 Ability to put quantitative or numerical information into verbal or narrative form.

22.4 Knowledge of alternate methods of presenting statistical data (e.g., charts, graphs, or tables).

22.5 Knowledge of publication outlets for research reports, articles, or books.

22.6 Ability to prepare and deliver an oral report of the research or evaluation findings.

23. Making recommendations as a result of the evaluation.

The evaluator's responsibility to evaluate does not end with the collection, analysis, and reporting of data. The data do not speak for themselves. Making recommendations is as much a part of the evaluator's job as publishing is that of the researcher.

24. Providing immediate feedback on program performance for use in decisions about program modification.

This is a function usually unique to the formative evaluator and suggests an ongoing monitoring of the program performance, with continuing feedback aimed at program improvement. Although summative evaluation and some types of research can result in some form of feedback, seldom do these activities require the immediacy of action required of the formative evaluator.

24.1 Ability to develop techniques for providing evaluative feedback to program or project personnel in time to allow needed modifications to be made during the operation of the program.

24.2 Ability to identify the decision makers who need evaluative feedback.

25. Obtaining and managing resources (material and human) necessary to conduct the research or evaluation study.

Some researchers and evaluators do not have to concern themselves routinely with funding and management of research and evaluation activities. However, most do. It is a rare researcher or evaluator indeed who completes an entire career without encountering these tasks.

They are so commonly required that it seems prudent to include the following competencies in the training of researchers and evaluators.

25.1 Knowledge of effective techniques for writing and submitting proposals to obtain funding and negotiating with funding agencies.

25.2 Knowledge of legalities related to research and evaluation projects.

25.3 Ability to determine human and financial resources necessary to conduct a program or project and use accounting procedures to operate within a program or project budget.

25.4 Ability to estimate realistically the time required for research and evaluation activities.

25.5 Knowledge of and ability to use management and planning systems such as PERT (Program Evaluation and Review Technique), PPBS (Program Planning Budgeting System), or Critical Path Analysis.

III. CONCLUSION

The lists of tasks and competencies presented in this paper are incomplete and will need expansion and refinement over time. Educational research and evaluation are rapidly advancing fields. The tasks listed herein held for the late sixties and early seventies. Developments subsequent to 1971 are not considered here, so while the tasks and competencies listed are still relevant, the list itself may already be dated. This seems especially likely in view of the recent expansions in the use of anthropological, economic, linguistic, historical, and philosophical analysis techniques in educational research and the introduction of new evaluation approaches (e.g., Stake, 1972) which require more attention to the many noncognitive elements of performance in evaluation work. However, the lists presented herein would seem to include a majority of the tasks and competencies required in standard empirical, behavioral inquiry activities which still seem most commonly in use in the field of education.

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